

**Remarks****I. Claim Status:**

Claims 1-27, 29-34 and 37-45 are pending and stand rejected. Claims 28, 35 and 36 are canceled without prejudice.

**II. Rejections under 35 U.S.C. § 112, second paragraph:**

Claims 1-27 and 29-45 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 1-27, 29-34 and 37-45 have been amended to more particularly point out and distinctly claim that which the applicants regard as their invention. Support for the amendments is found throughout the specification and specifically in the third paragraph on page 2 of the specification with respect to the amendments to claim 1. Claims 35 and 36 are canceled thereby rendering the rejections thereof moot. Reconsideration and removal of the rejections of claims 1-27, 29-34 and 37-45 are respectfully requested.

**III. Rejections under 35 U.S.C. § 103(a):**

Claims 1-17, 29, 31, 32 and 37-45 stand rejected under 35 U.S.C. § 103(a) as being obvious over Mukainakano et al. (U.S. 4,523,552) in view of design choices. Applicants' invention, as described and claimed, solves two conflicting problems with one novel and unobvious solution. The first problem is to provide a means to reliably and quickly ignite lean and extremely lean fuel/air mixtures in internal combustion

engines. The second is to permit low-pollutant operation. Applicants' invention solves these problems with two steps. The first is to set the fuel/air mixture temperature to a point less than the spontaneous ignition temperature. Claim 1, as amended, requires the temperature of the fuel/air mixture in an engine's combustion chamber to be set to at least over 80% and up to at most 98% of the fuel/air mixture's spontaneous ignition temperature so that the set temperature is therefore different from the spontaneous ignition temperature. The second step to start ignition is to introduce a time-controlled laser light into the combustion chamber to precisely control the ignition timing. This approach results in a fast, stable ignition with precise timing.

In contradistinction, Mukainakano et al. discloses introducing particles having a high light absorption index into the combustion chamber separately from the fuel/air mixture. The particles are described as being either combustible or non-combustible [2:47-51]. Whether combusted or not, the particles provide additional pollutants in the exhaust—a condition completely contrary to the purpose of Applicants' invention as claimed. On this basis alone, Mukainakano et al. teaches away from Applicants' invention.

Moreover, Mukainakano et al. does not show or suggest Applicants' claimed two step procedure. The reference does not disclose setting the fuel/air mixture temperature to a selected range short of the spontaneous ignition temperature, and does not disclose the introduction of a time-controlled laser light to start the ignition. Instead, Mukainakano et al. uses a relatively uncontrolled laser light to heat the light-

absorbing particles until combustion begins. This "one-step" process is affected by and dependent on boundary conditions such as the absorption index and distribution of the light-absorbing particles. Applicants' invention eliminates the need for light-absorbing particles by combining the set fuel/air mixture temperature with the time-controlled laser light. Applicants' invention results in ignition when the laser is turned on. Ignition in the Mukainakano et al. system does not take place until well after the laser is switched on, and thus, cannot be directly controlled. This results in a very inefficient and relatively high pollutant approach when compared to Applicants' claimed invention.

For all the foregoing reasons, claim 1 as amended, should not properly be considered as obvious in view of Mukainakano et al. Reconsideration and removal of the rejection of claim 1 are respectfully requested.

Claims 2-17, 29, 31, 32 and 37-45 depend, directly or ultimately, from claim 1 and are allowable for the same reasons given for claim 1. Reconsideration and removal of the rejections of claims 2-17, 29, 31, 32 and 37-45 are respectfully requested.

#### **IV. Allowable Subject Matter**

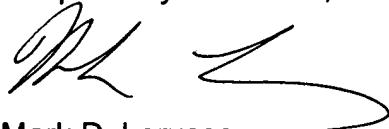
Applicants acknowledge with thanks the finding that claims 18-27, 30, 33 and 34 are allowable with correction of the § 112, second paragraph issues and if rewritten in independent form. The claims have been amended to address the 112 issues. Because base claim 1 in its current amended form is considered allowable over the

prior art of record, Applicants have refrained from rewriting the dependent claims in independent form. Reconsideration and allowance of claims 18-27, 30, 33 and 34, as amended, are respectfully requested.

**IV. Conclusion:**

For all the foregoing reasons, the claims are considered definite and are considered to define patentably over the prior art. Reconsideration is requested and favorable action is solicited.

Respectfully submitted,



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